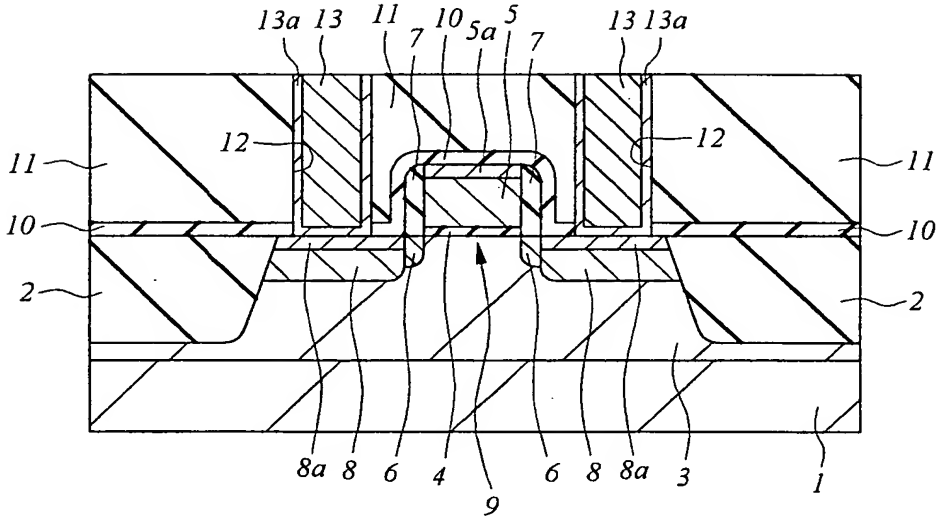
FIG. 1


13a
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5a
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13a
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8a
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8a
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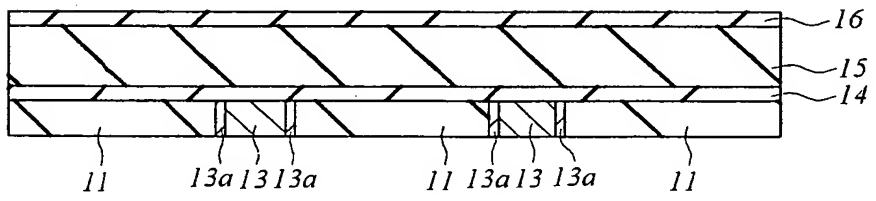
FIG. 2


16
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13a
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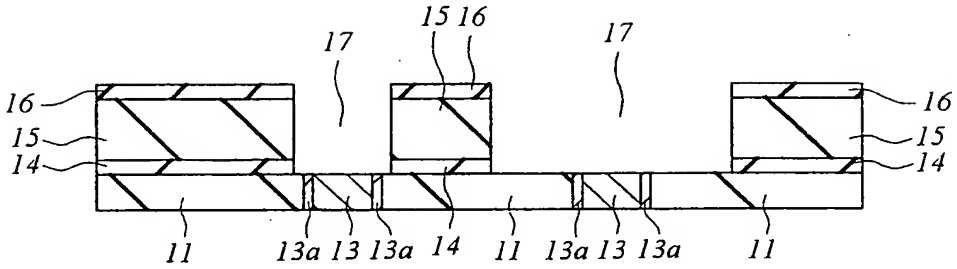
FIG. 3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13a 13 13a
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FIG. 4

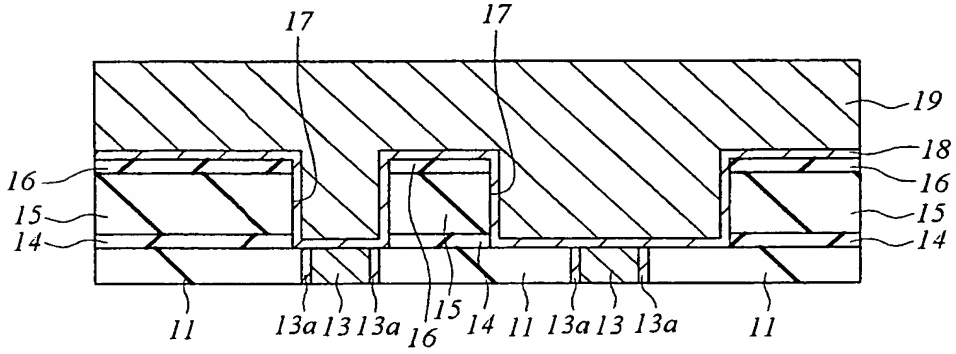
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FIG. 5

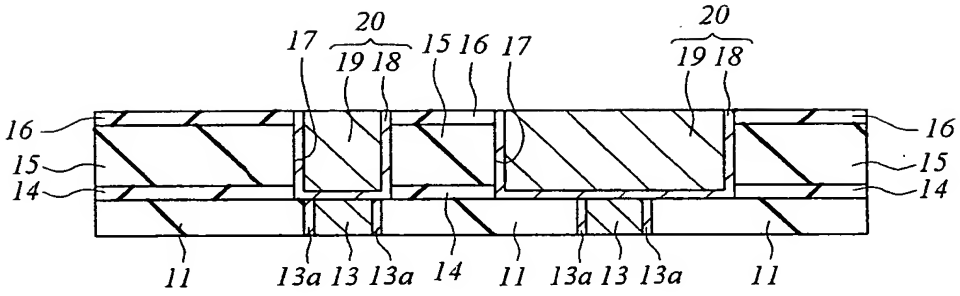
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FIG. 6

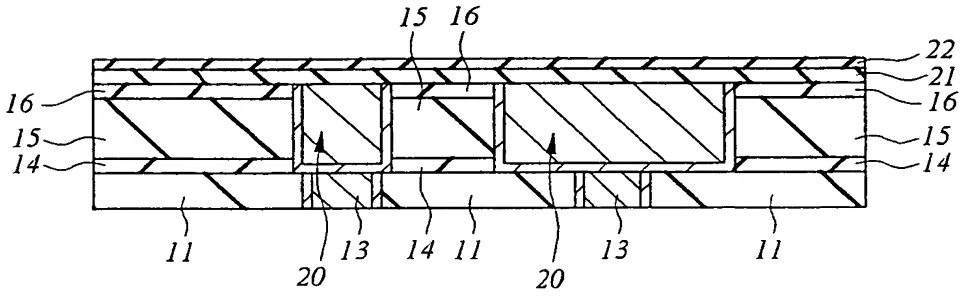
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FIG. 7

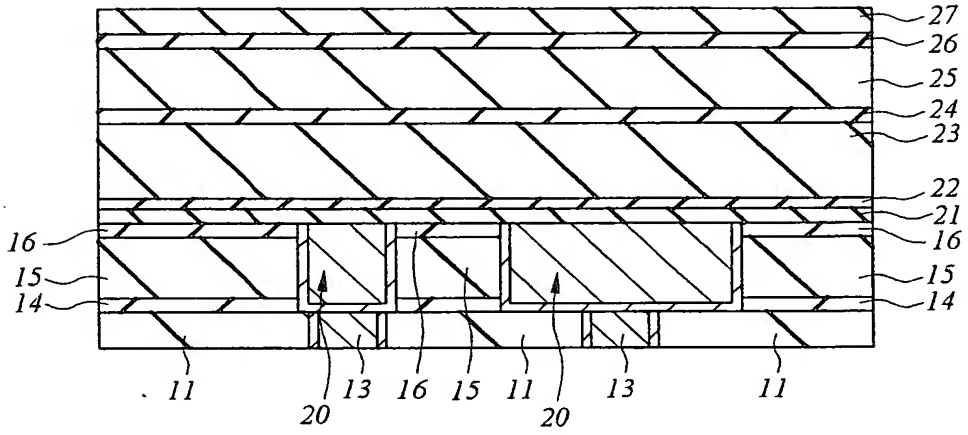
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FIG. 8

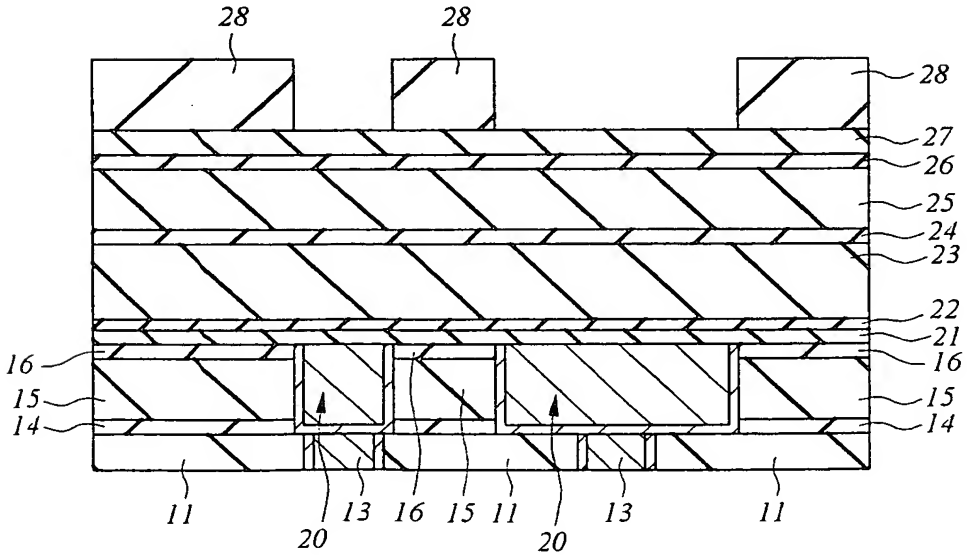
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FIG. 9

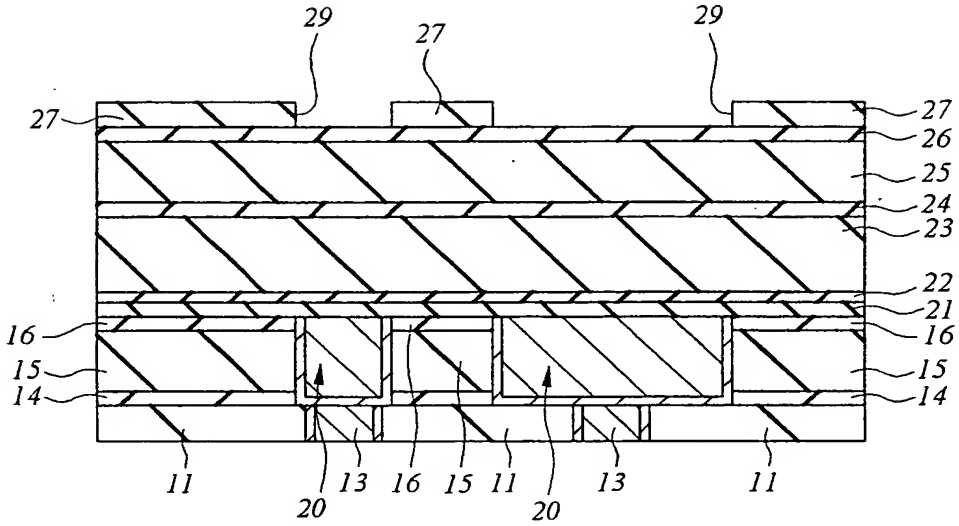
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FIG. 10

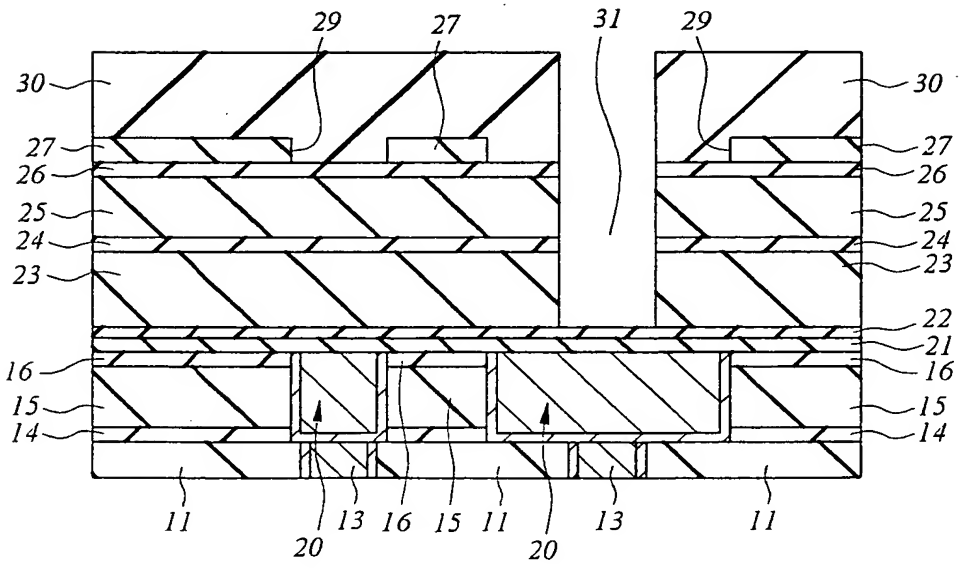
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FIG. 11

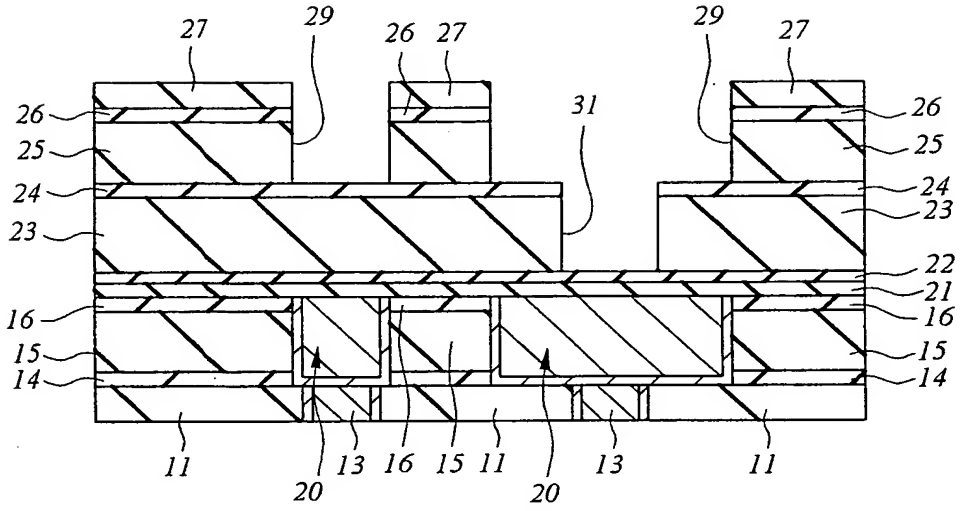
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FIG. 12

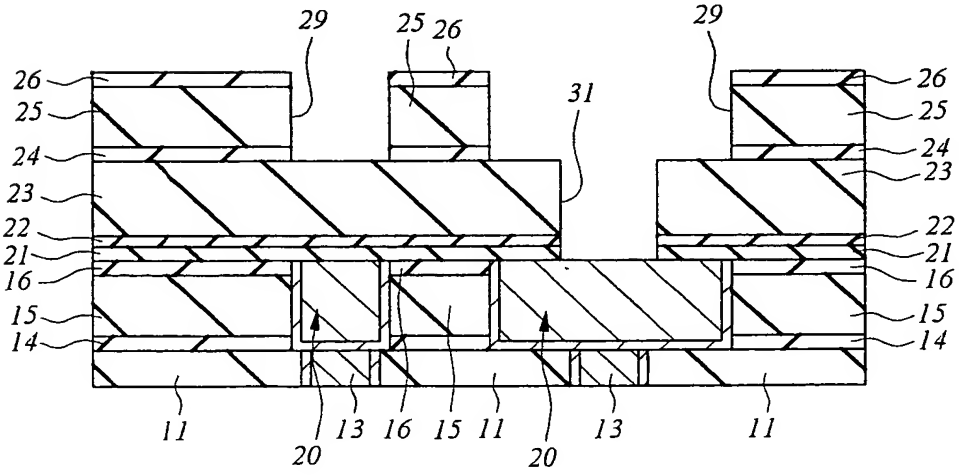
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FIG. 13

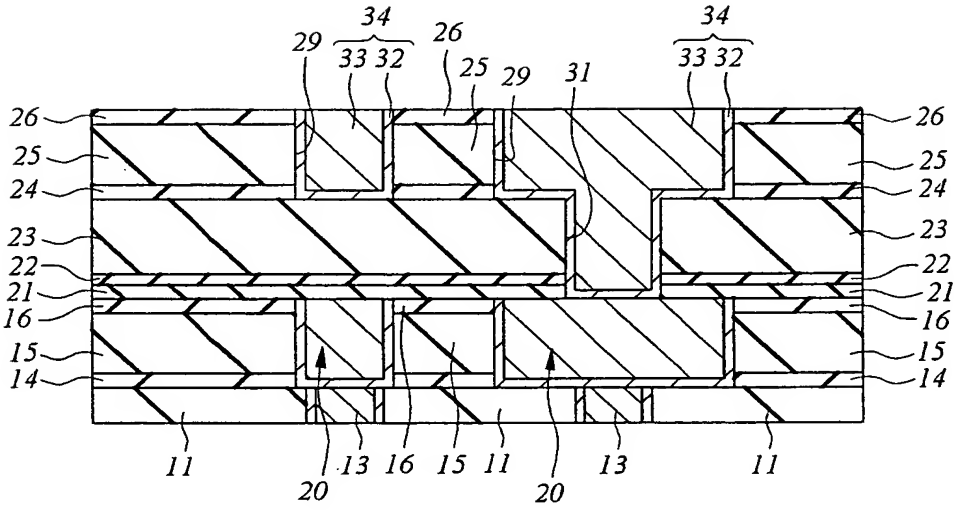
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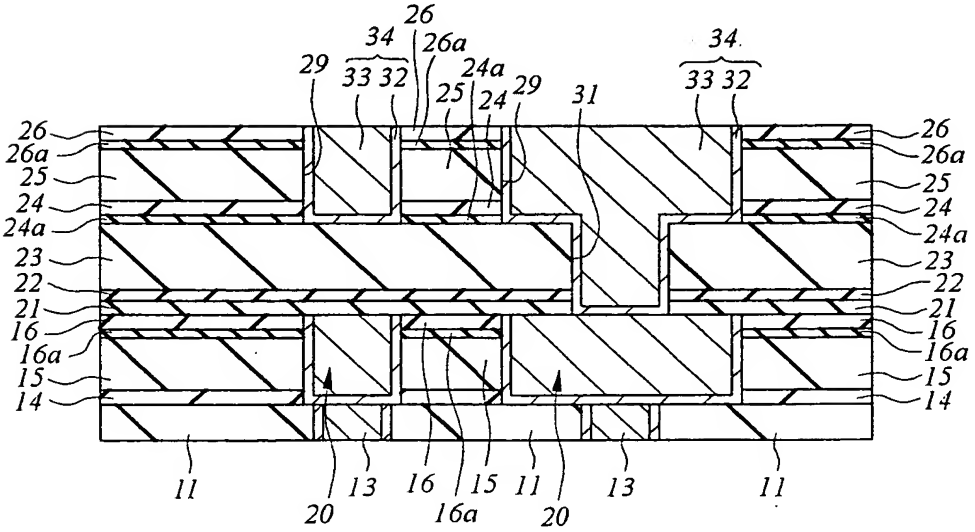
FIG. 14


26
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26a
24a
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33 32
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33 32
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26a
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24a
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16a
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16a
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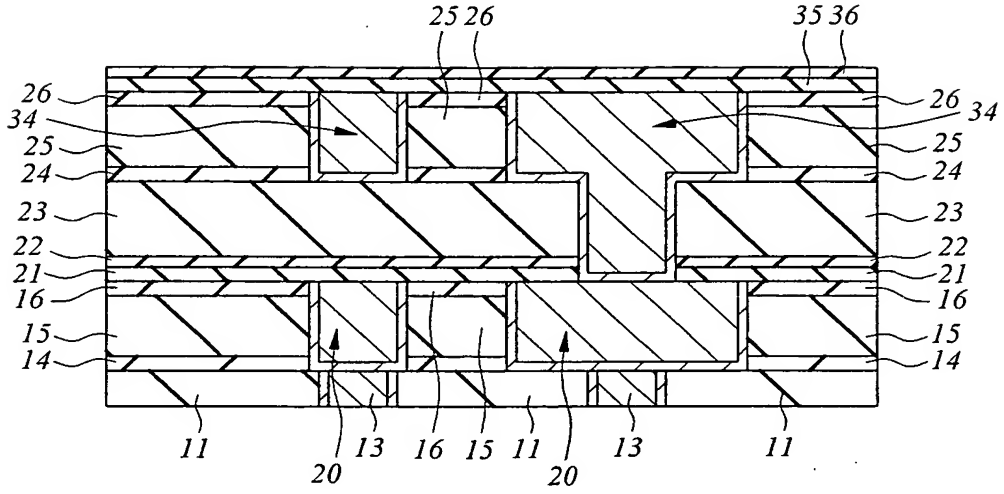
FIG. 15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35 36
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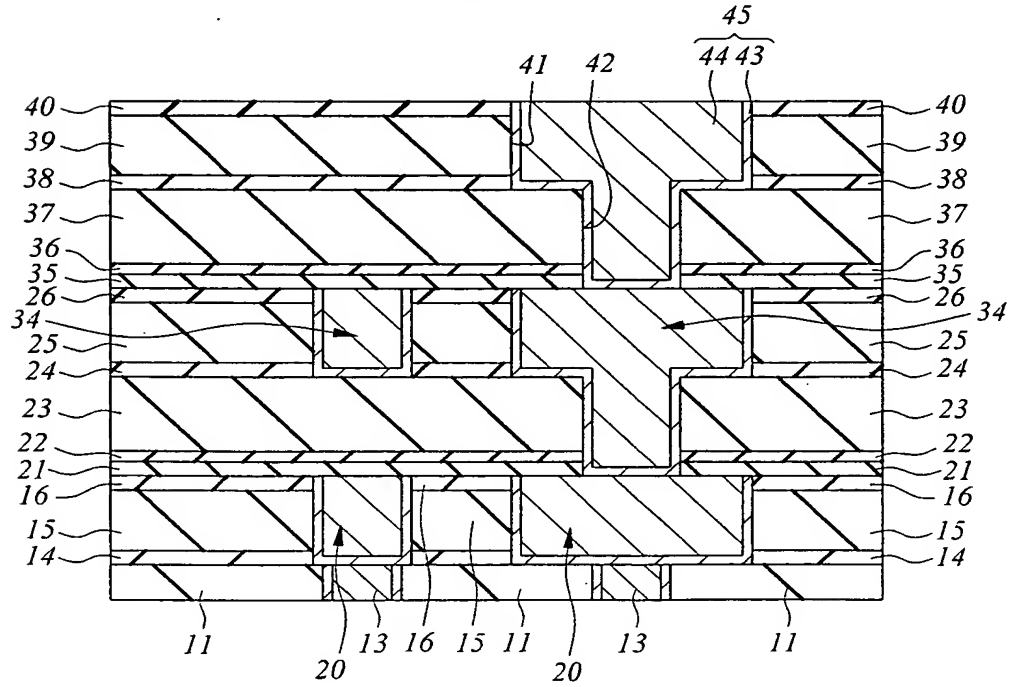
FIG. 16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44 43
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FIG.17

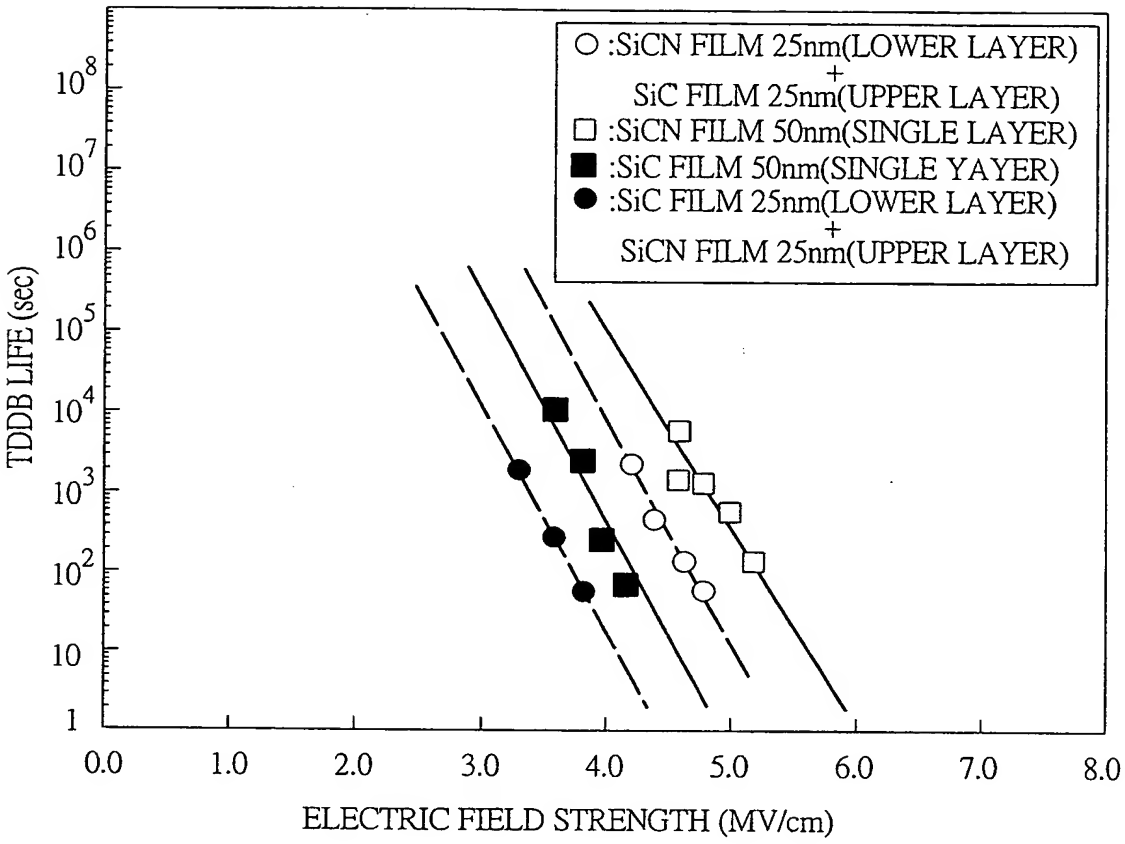

○ :SiCN FILM 25nm(LOWER LAYER)
+
SiC FILM 25nm(UPPER LAYER)
□ :SiCN FILM 50nm(SINGLE LAYER)
■ :SiC FILM 50nm(SINGLE YAYER)
● :SiC FILM 25nm(LOWER LAYER)
+
SiCN FILM 25nm(UPPER LAYER)
TDDB LIFE (sec)
10^8
10^7
10^6
10^5
10^4
10^3
10^2
10
1
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
ELECTRIC FIELD STRENGTH (MV/cm)

FIG.18

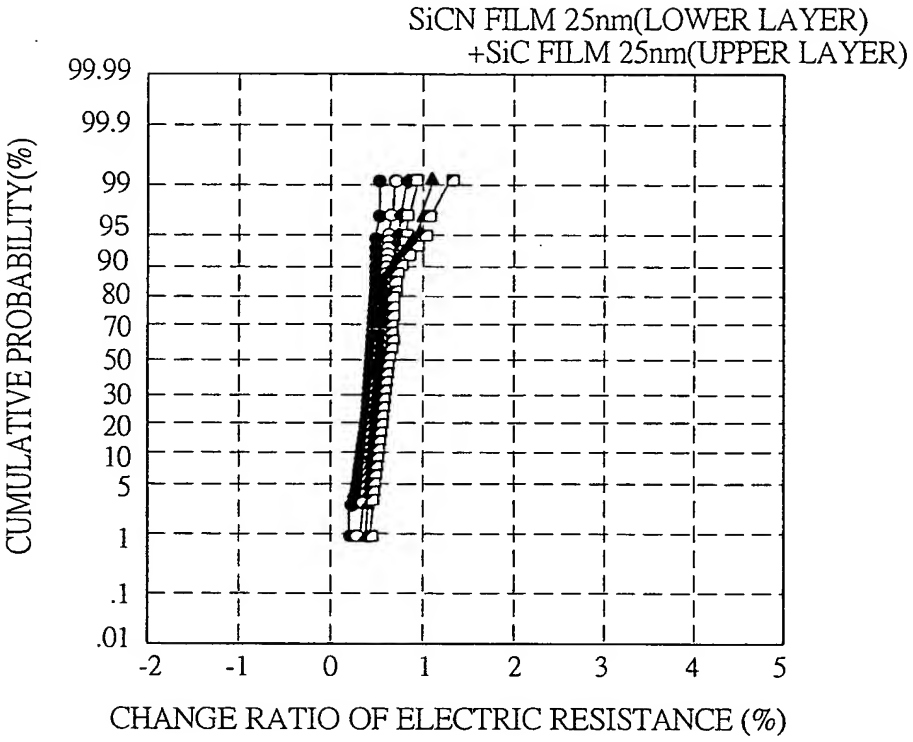

SiCN FILM 25nm(LOWER LAYER)
+SiC FILM 25nm(UPPER LAYER)
CUMULATIVE PROBABILITY(%)
99.99
99.9
99
95
90
80
70
50
30
20
10
5
1
.1
.01
-2
-1
0
1
2
3
4
5
CHANGE RATIO OF ELECTRIC RESISTANCE (%)

FIG.19

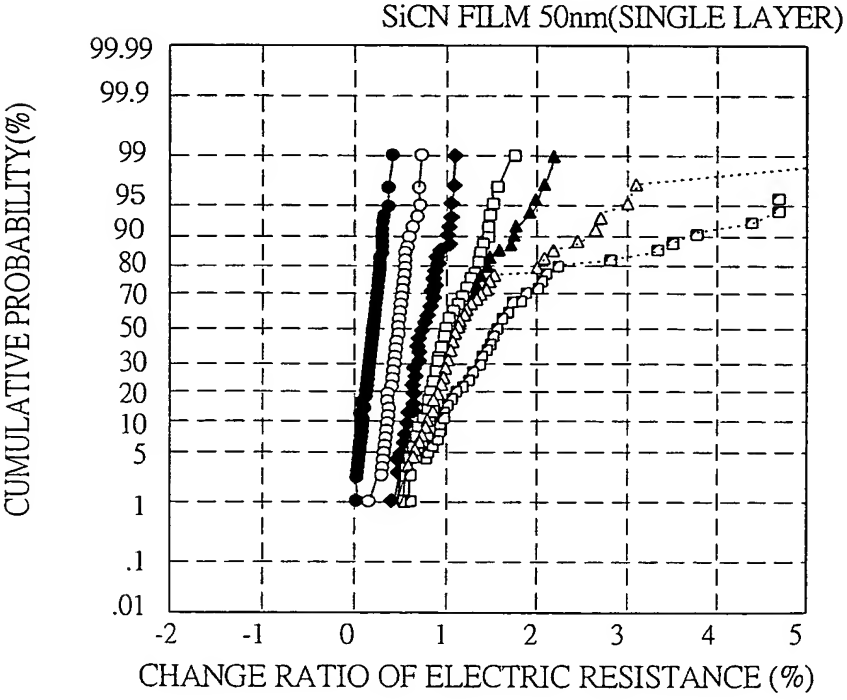

SiCN FILM 50nm(SINGLE LAYER)
CUMULATIVE PROBABILITY(%)
99.99
99.9
99
95
90
80
70
50
30
20
10
5
1
.1
.01
-2
-1
0
1
2
3
4
5
CHANGE RATIO OF ELECTRIC RESISTANCE (%)

FIG.20

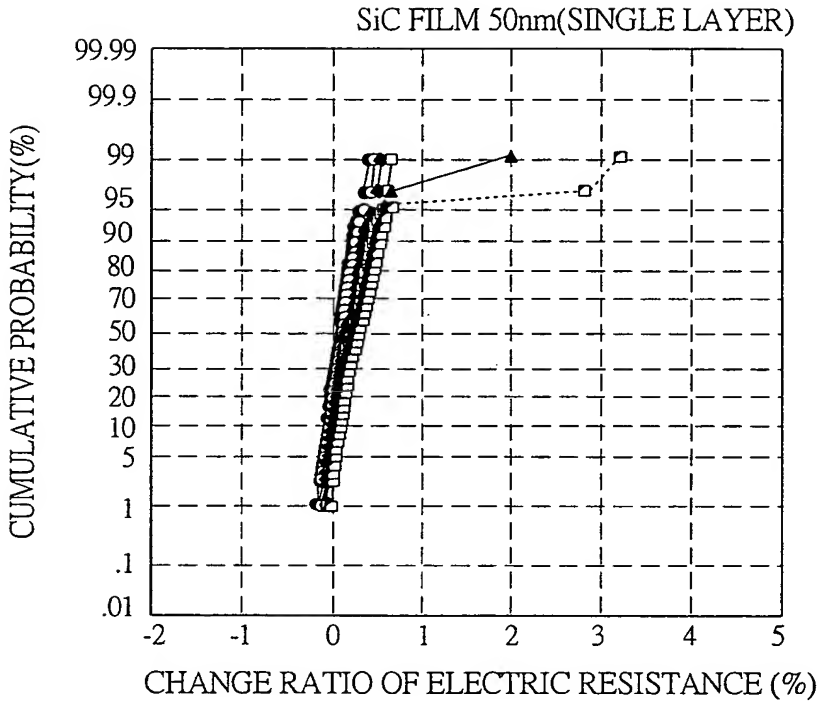
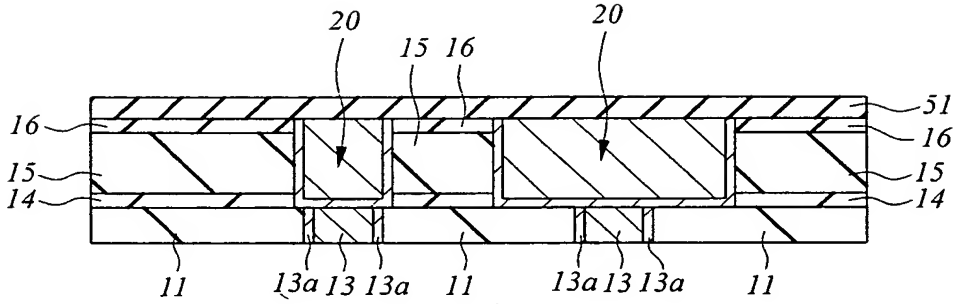

SiC FILM 50nm(SINGLE LAYER)
CUMULATIVE PROBABILITY(%)
99.99
99.9
99
95
90
80
70
50
30
20
10
5
1
.1
.01
-2
-1
0
1
2
3
4
5
CHANGE RATIO OF ELECTRIC RESISTANCE (%)

FIG. 21


20
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51
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14
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13a
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13a
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13a
13
13a
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FIG. 22

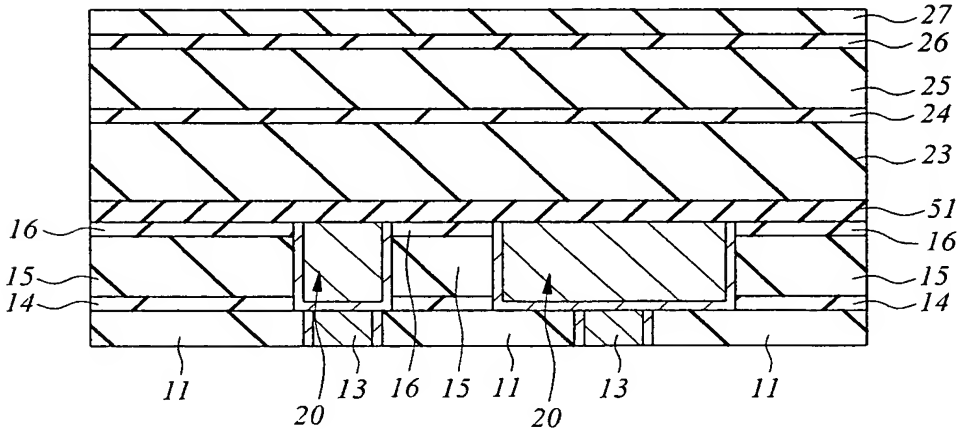
27
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FIG.23

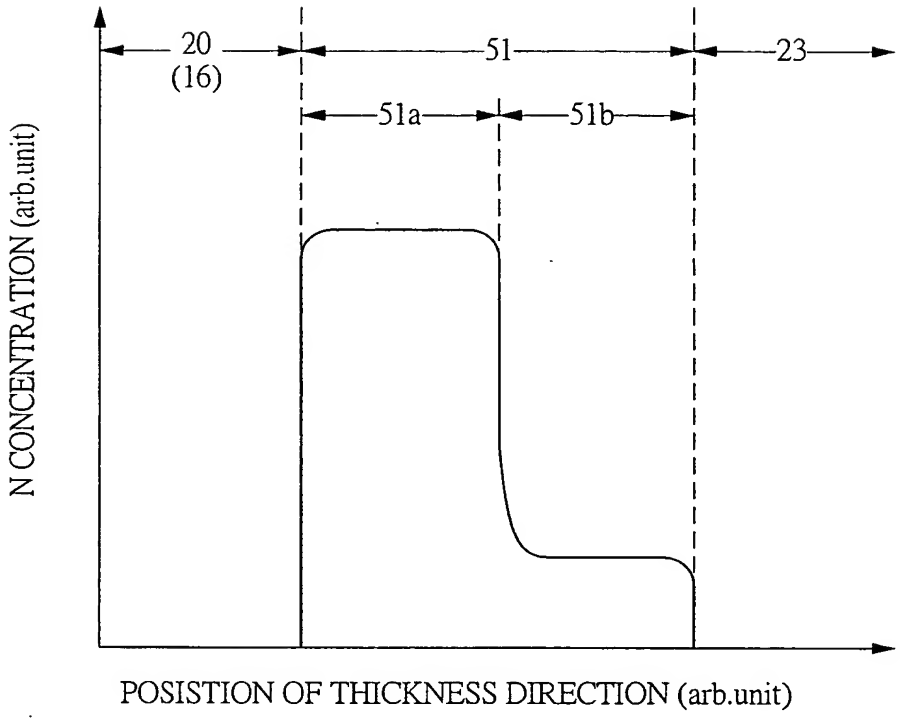
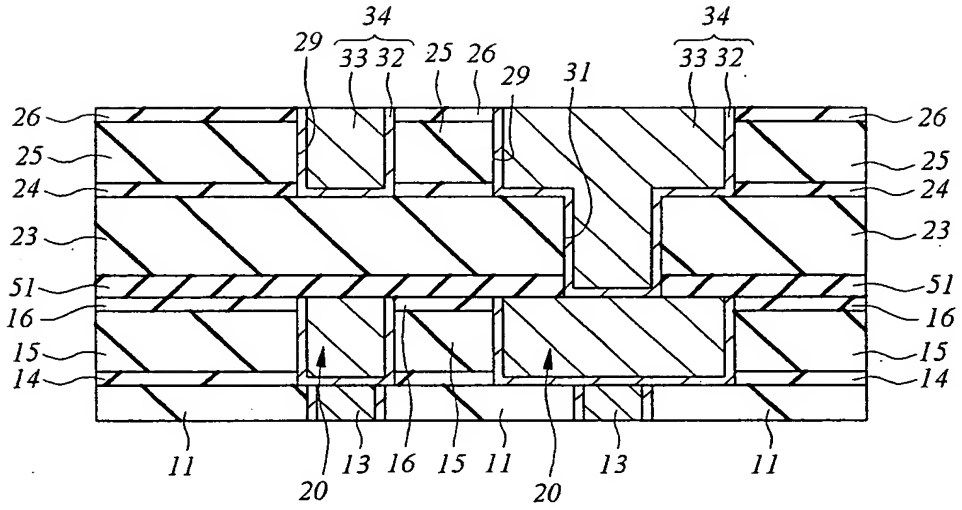

20
(16)
51
23
51a
51b
N CONCENTRATION (arb.unit)
POSISTION OF THICKNESS DIRECTION (arb.unit)

FIG. 24


34
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33 32
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33 32
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FIG. 25

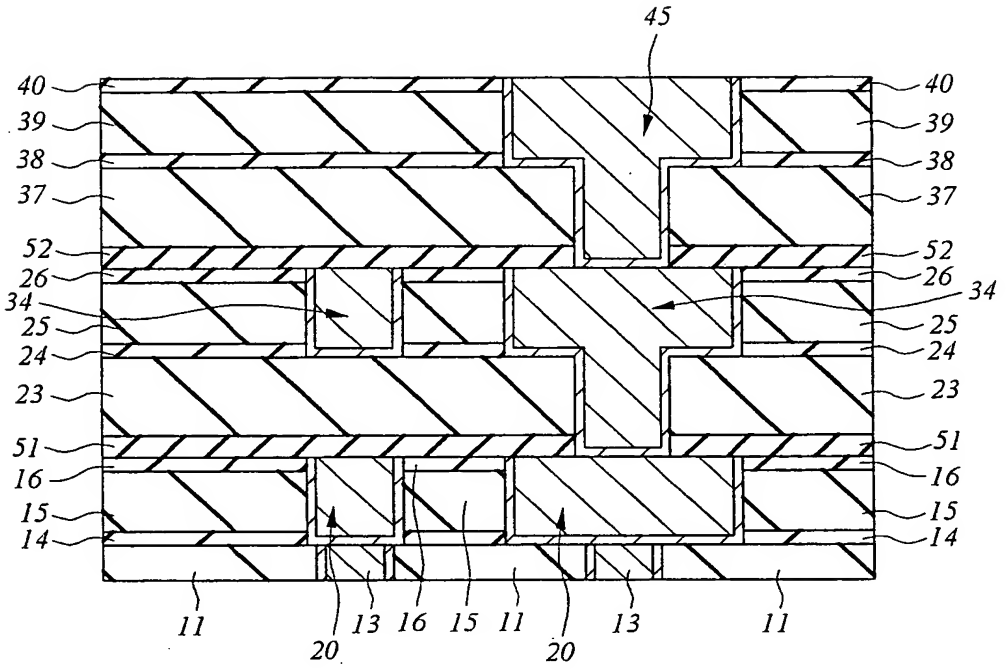
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FIG. 26

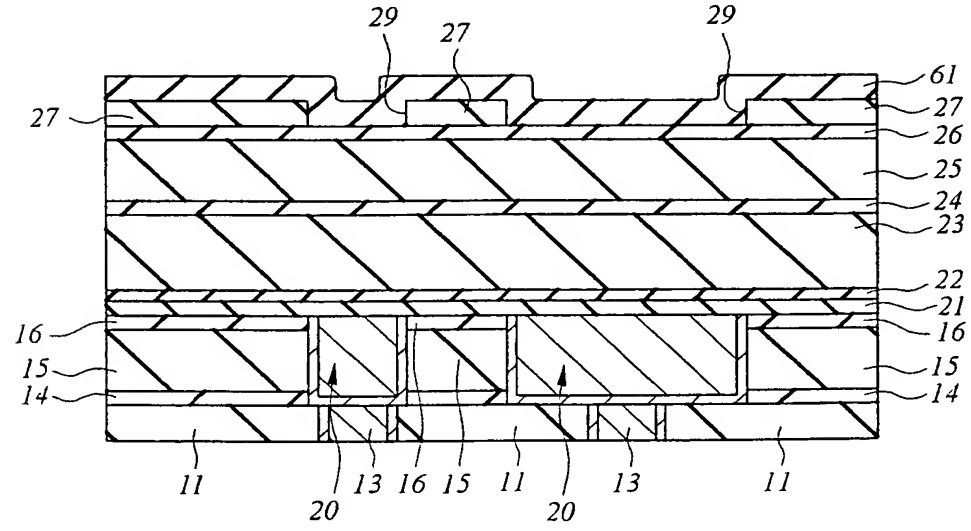
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FIG. 27

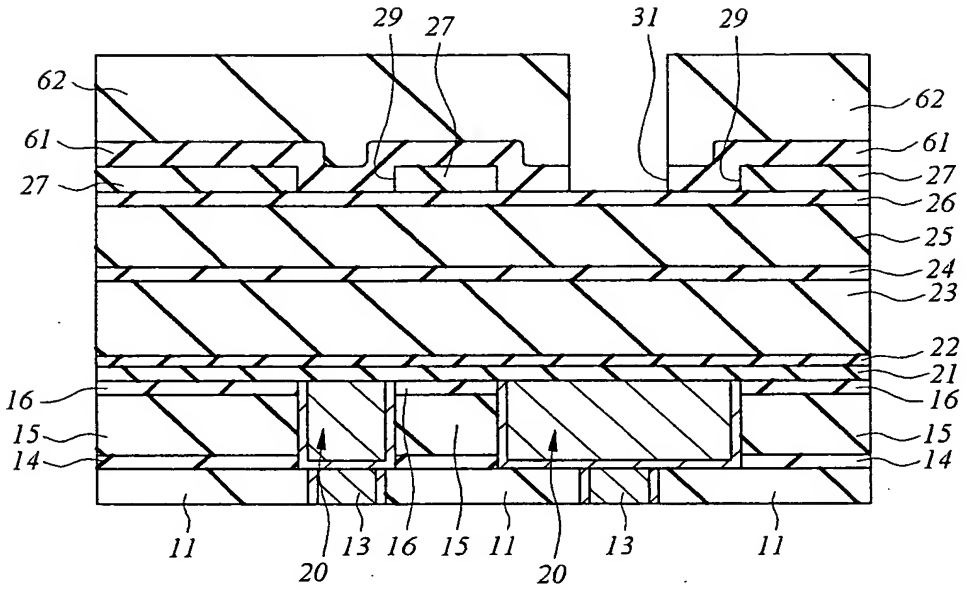
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FIG. 28

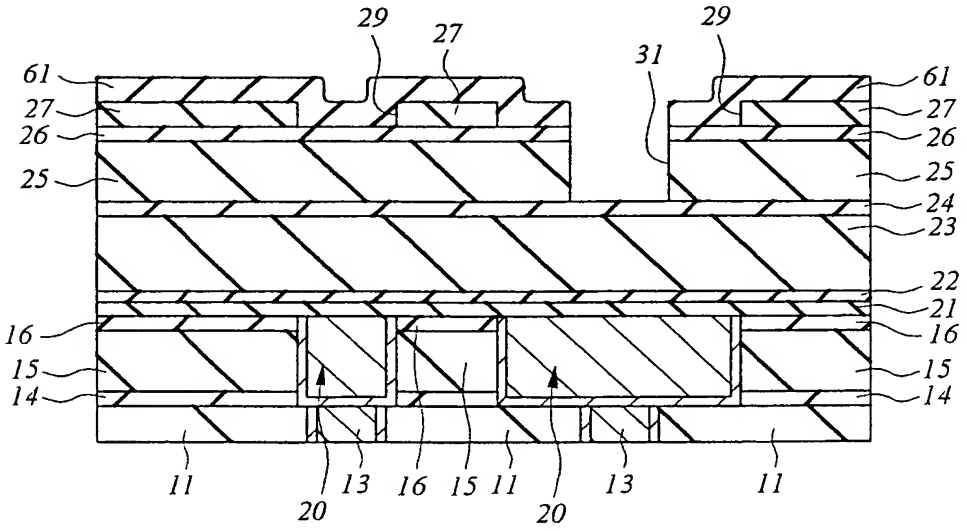
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FIG. 29

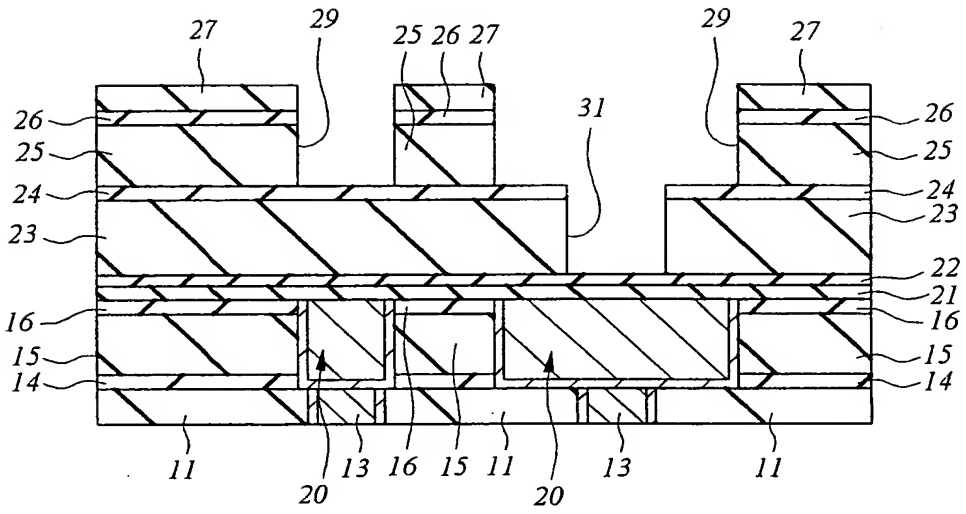
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FIG. 30

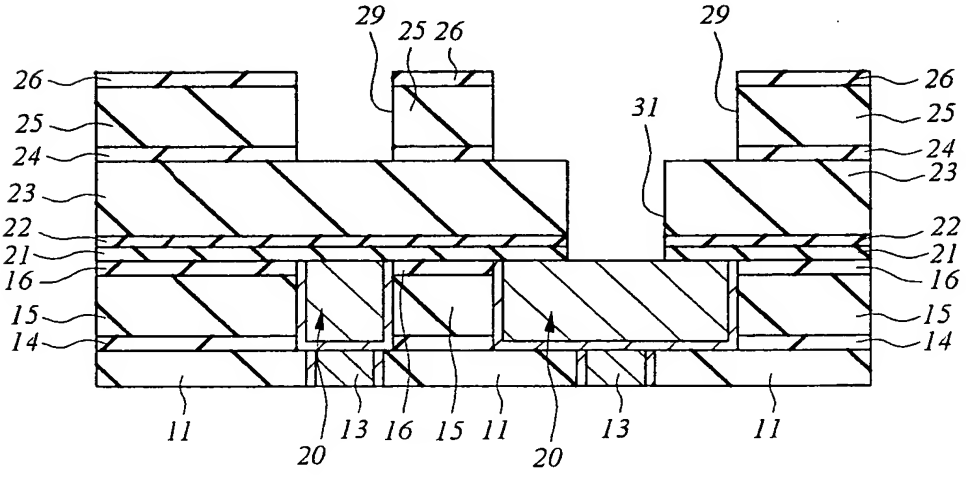
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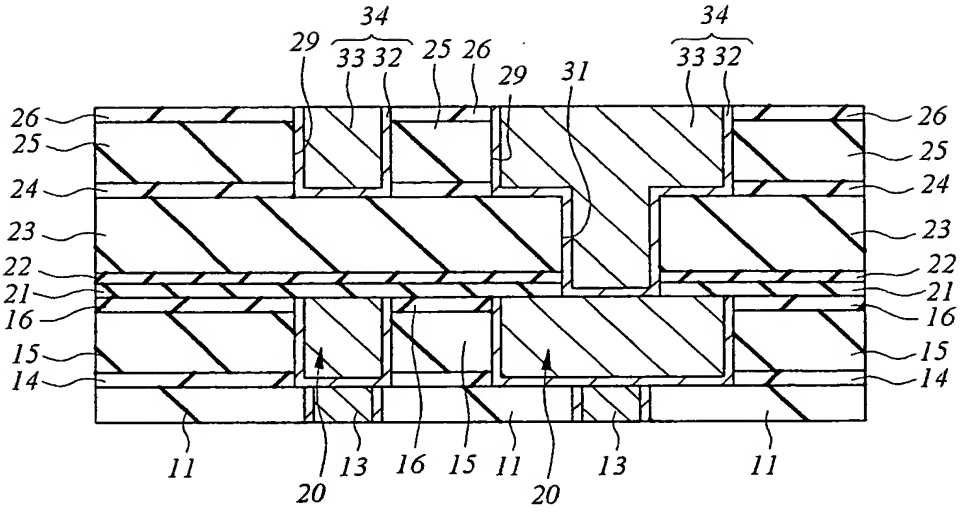
FIG. 31


34
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33 32
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33 32
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FIG. 32

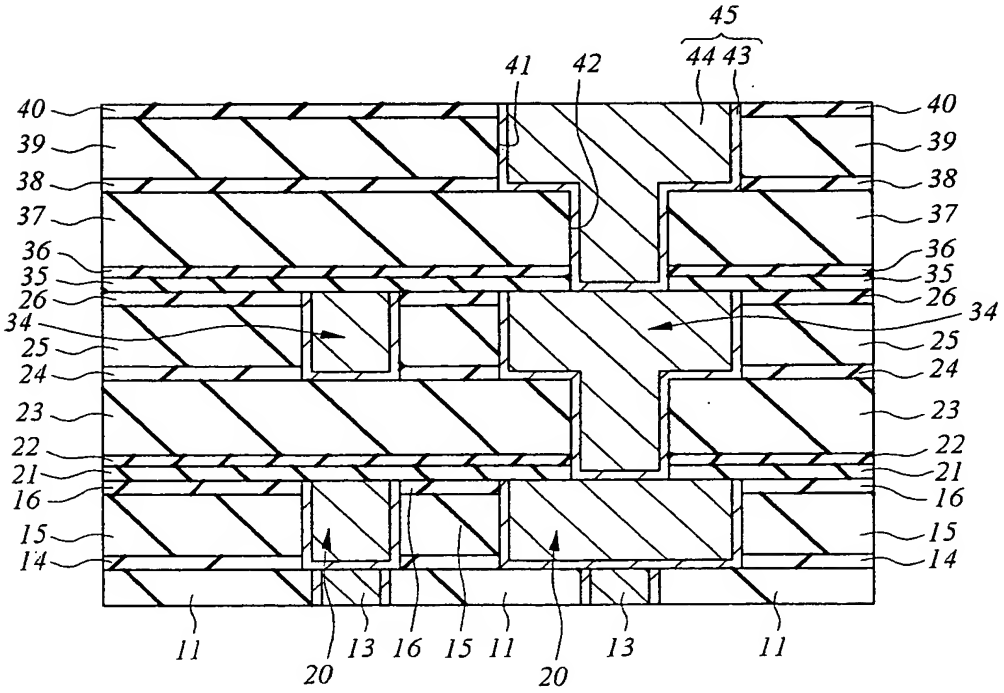
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FIG. 33

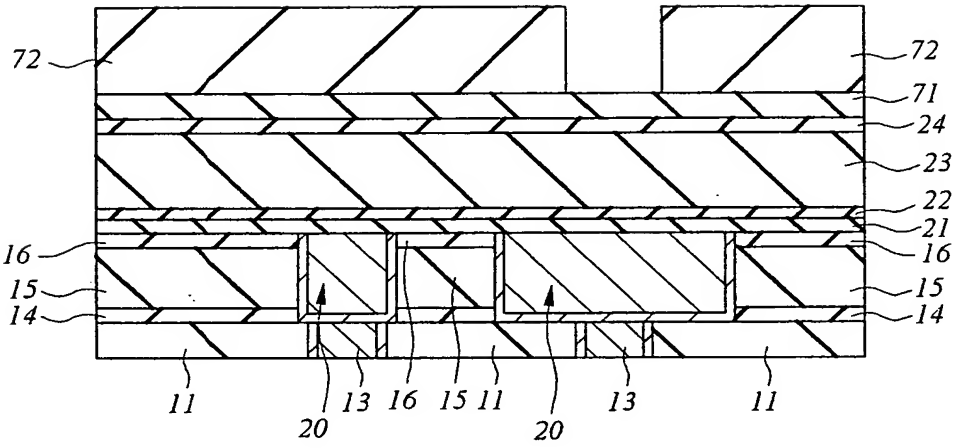
72
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FIG. 34

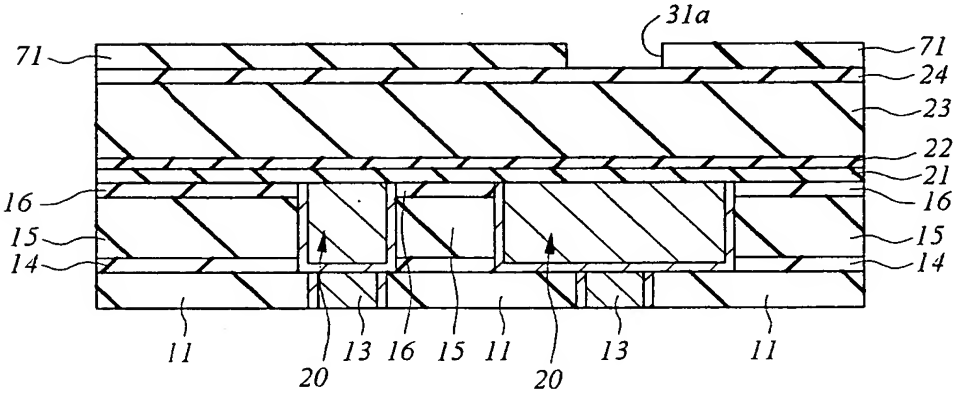
31a
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FIG. 35

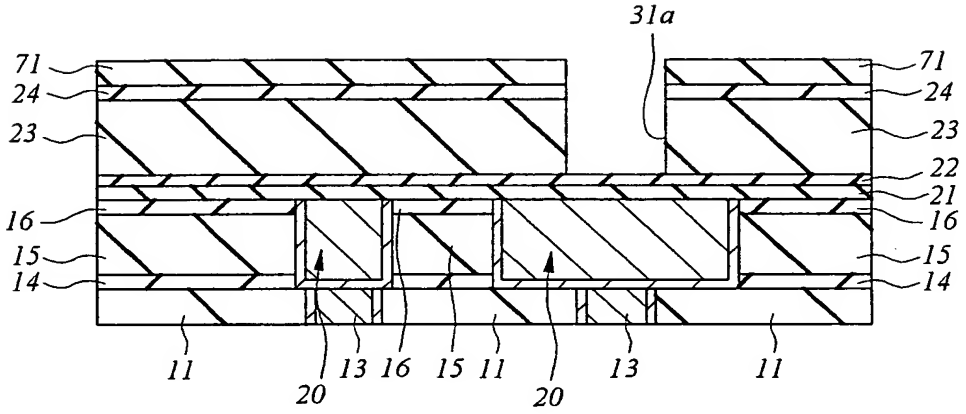
31a
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FIG. 36

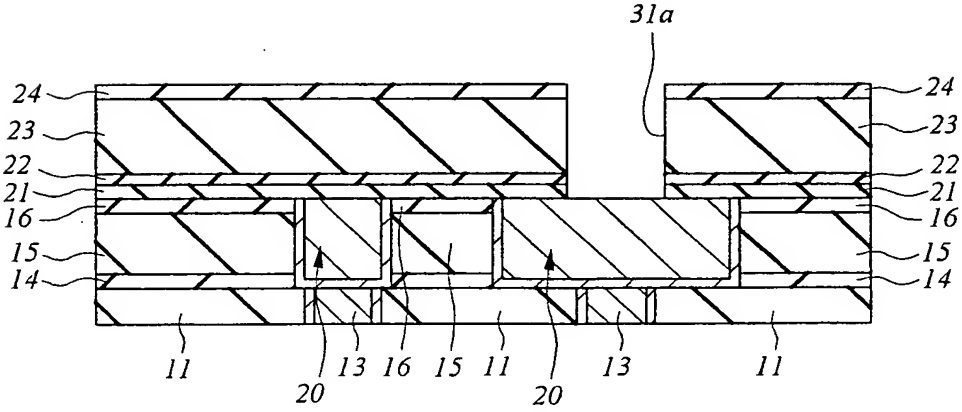
31a
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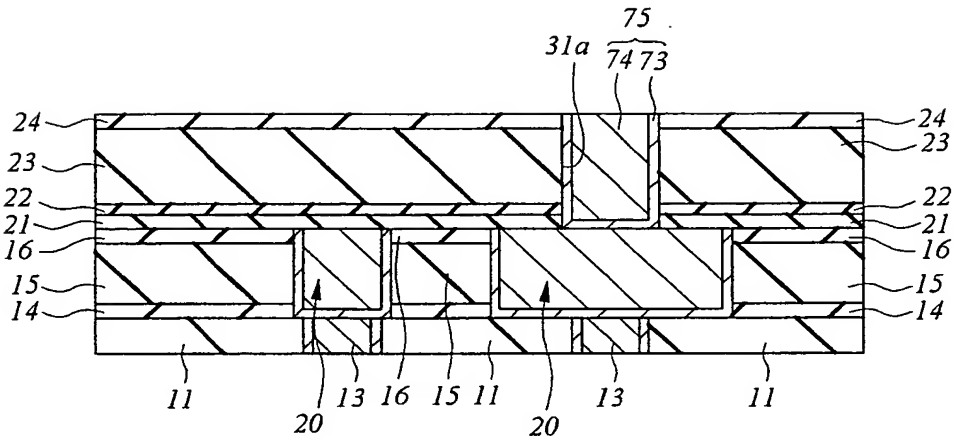
FIG. 37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31a
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FIG. 38

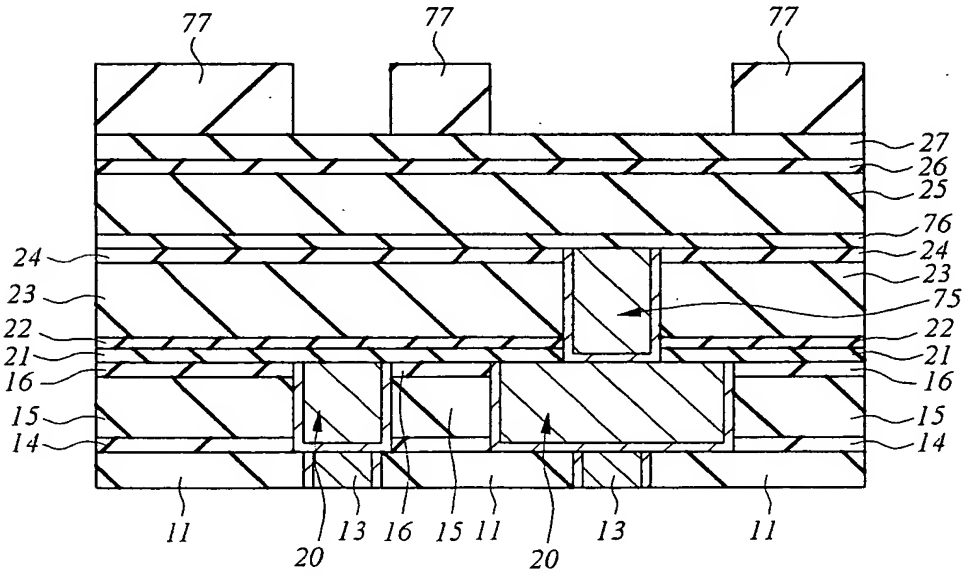
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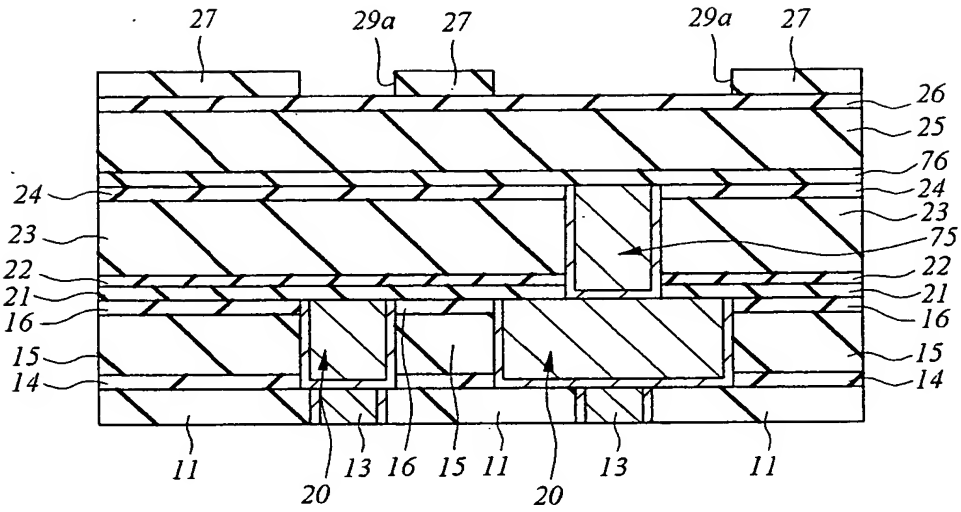
FIG. 39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29a
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FIG. 40

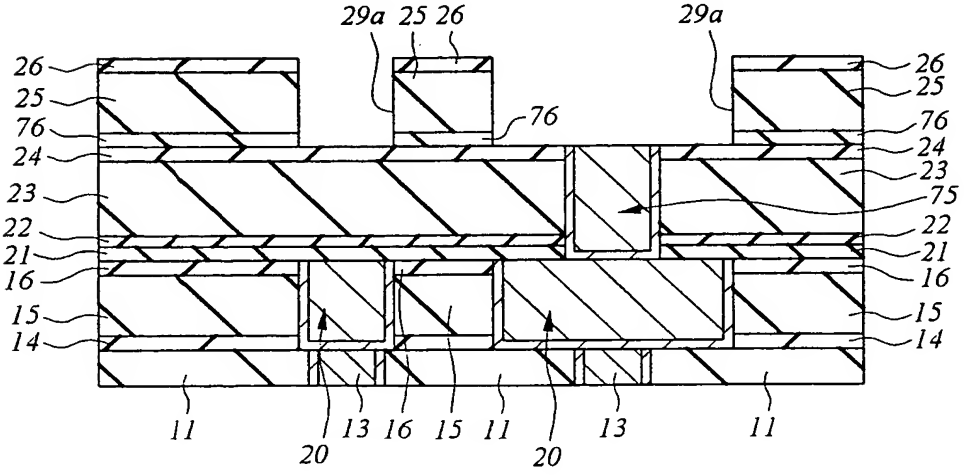
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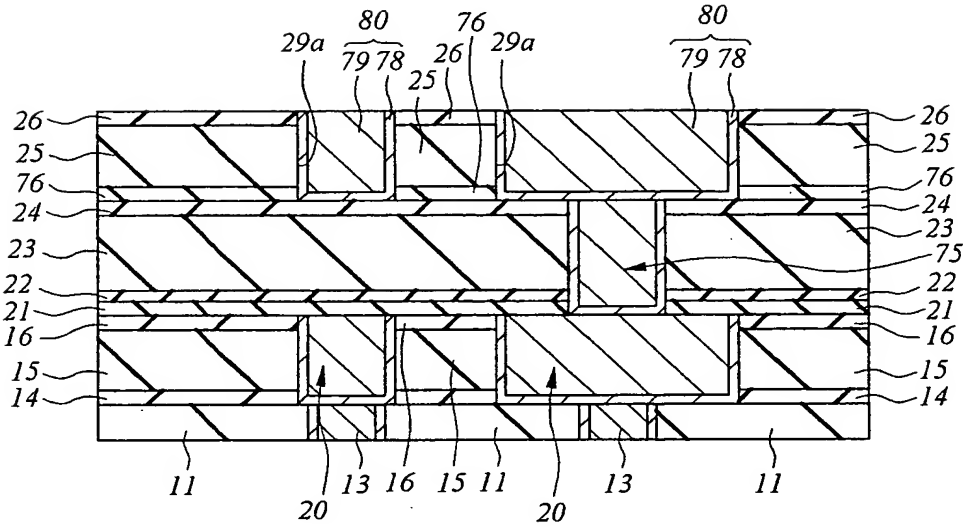
FIG. 41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79 78
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FIG. 42

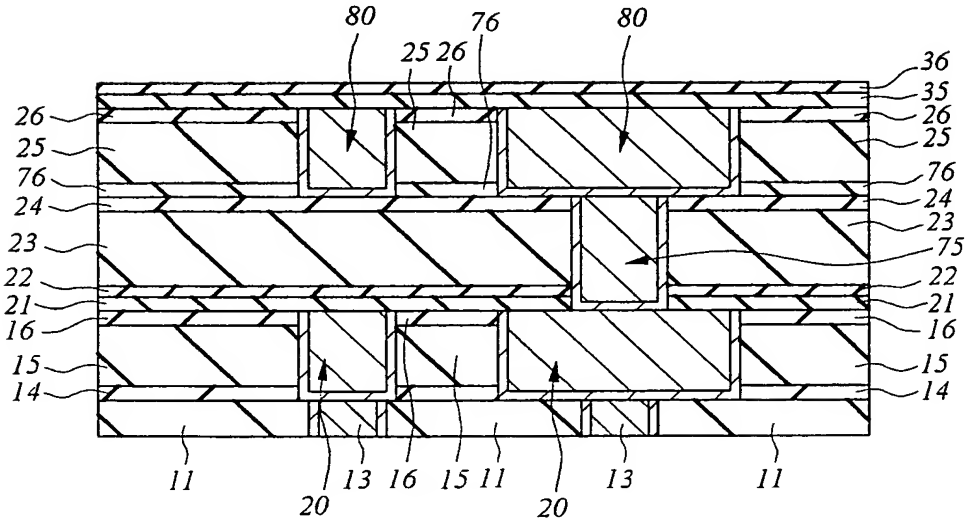
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FIG. 43

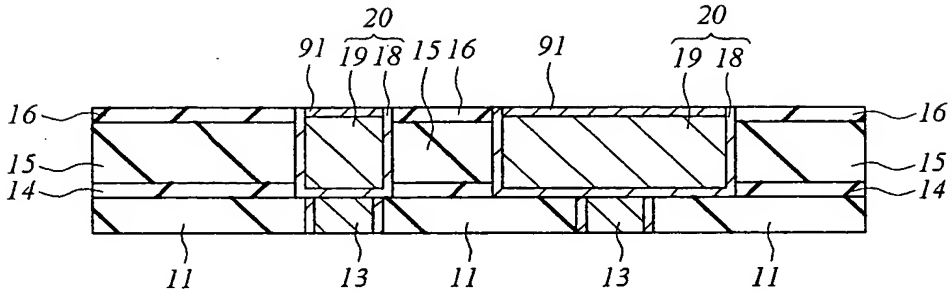
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FIG. 44

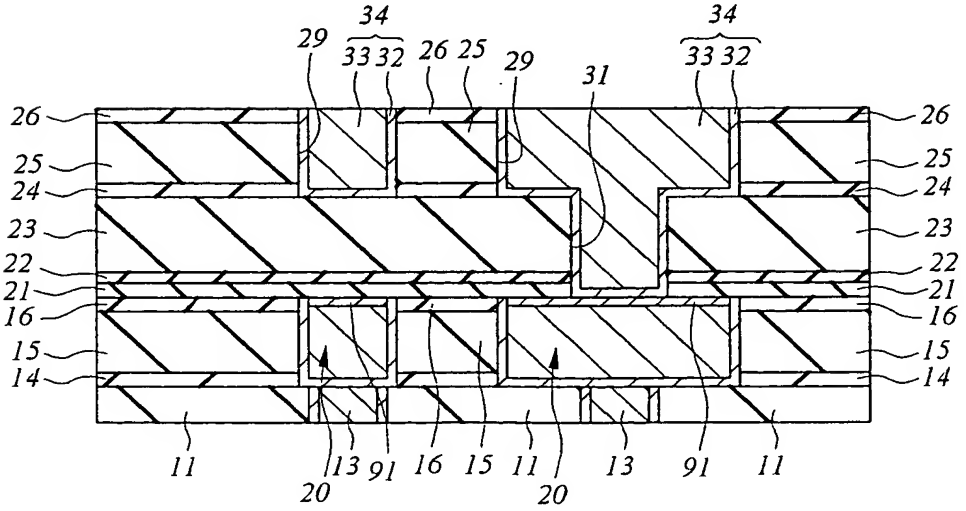
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FIG. 45

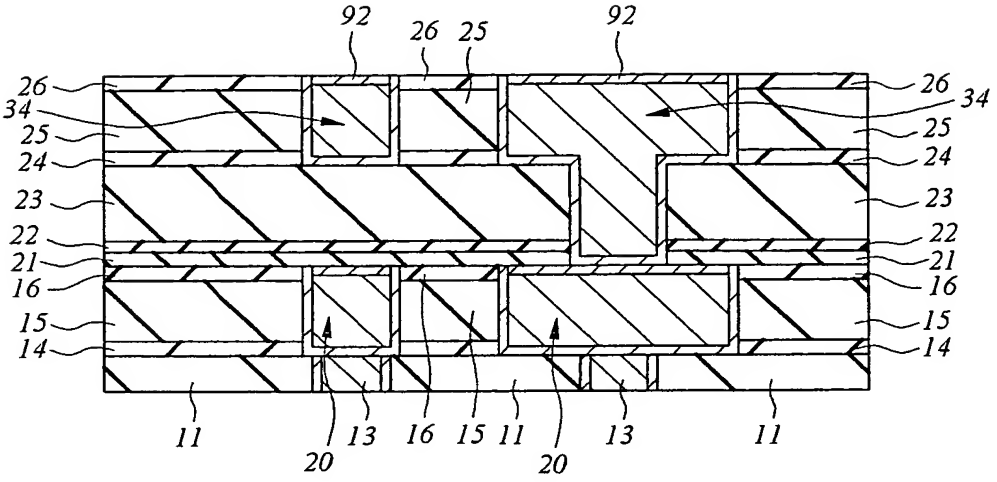
92
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FIG. 46

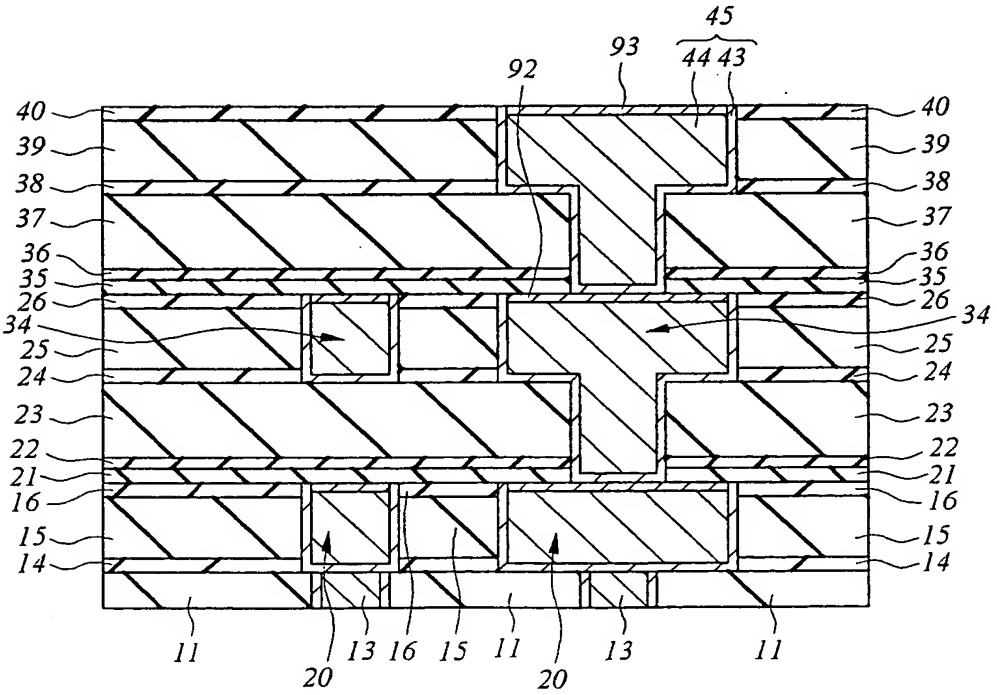
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FIG. 47

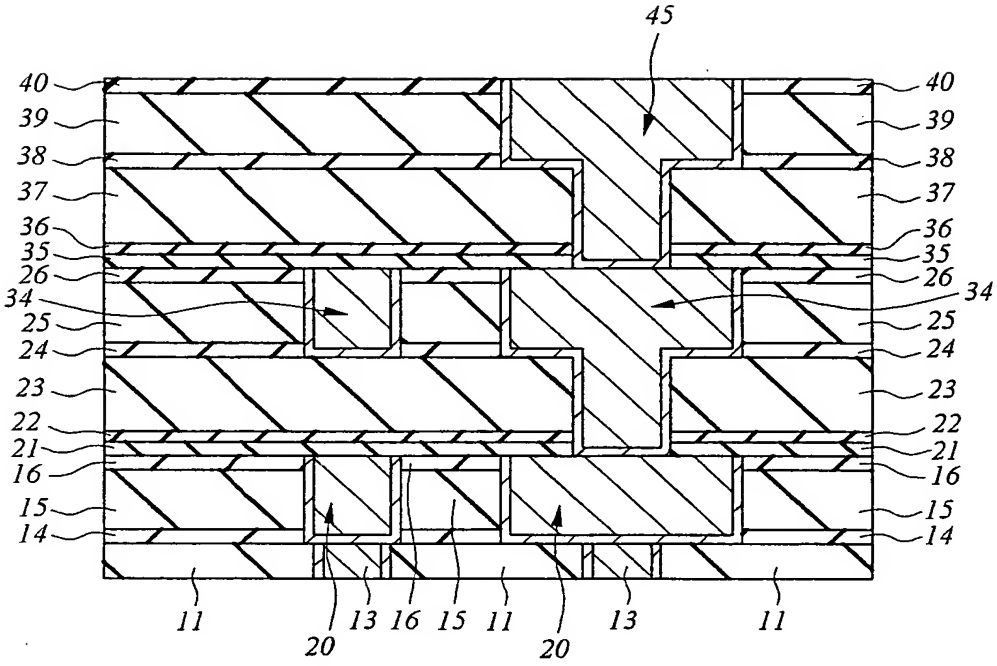
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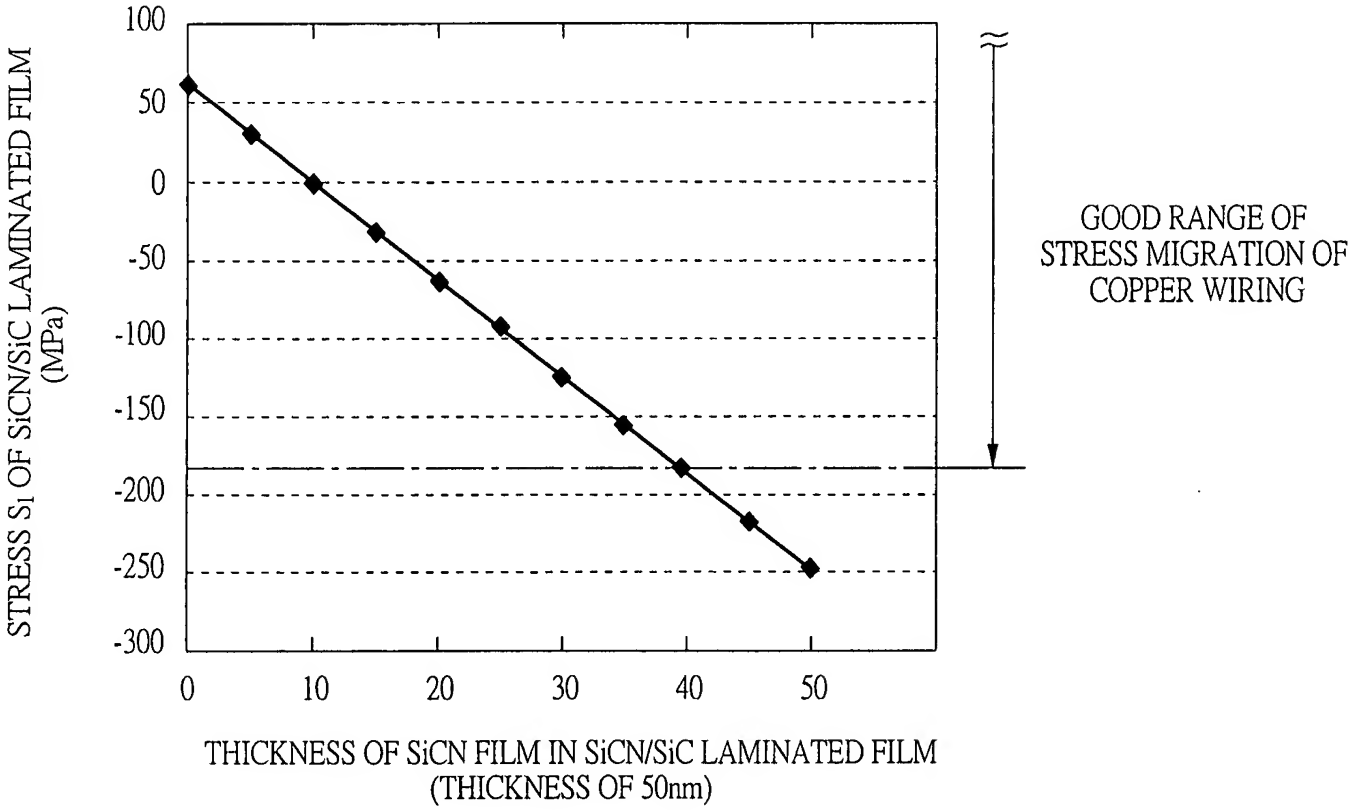
FIG.48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STRESS S_1 OF SiCN/SiC LAMINATED FILM (MPa)
THICKNESS OF SiCN FILM IN SiCN/SiC LAMINATED FILM (THICKNESS OF 50nm)
GOOD RANGE OF STRESS MIGRATION OF COPPER WIRING

FIG. 49

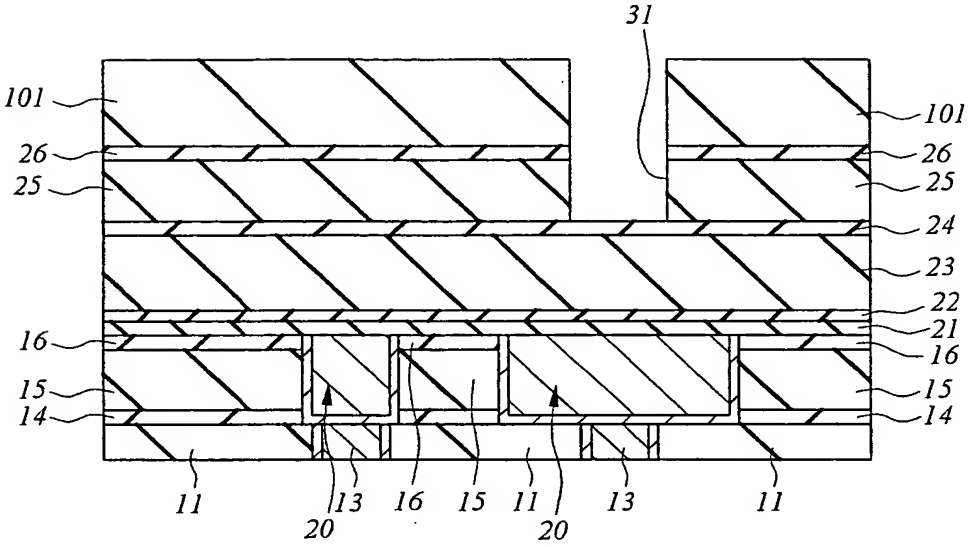
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FIG. 50

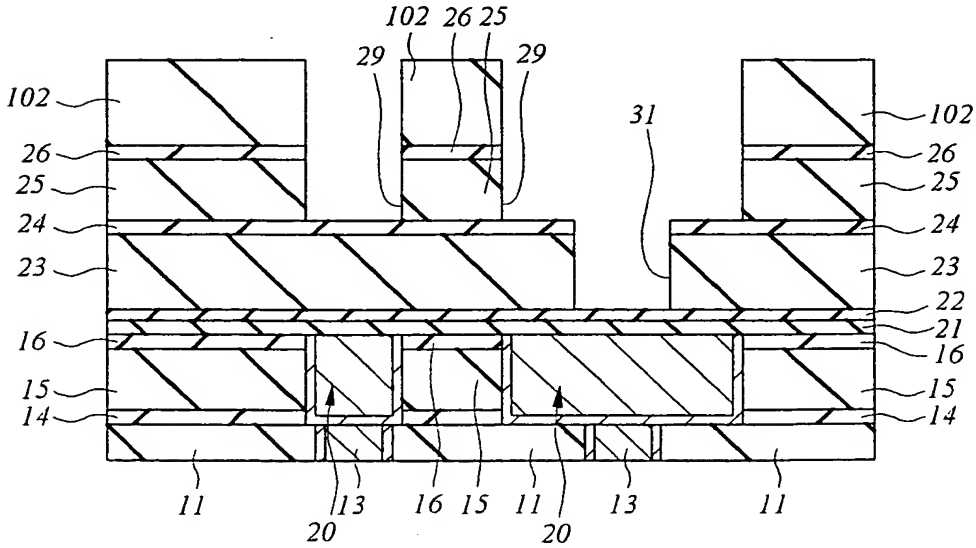
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FIG. 51

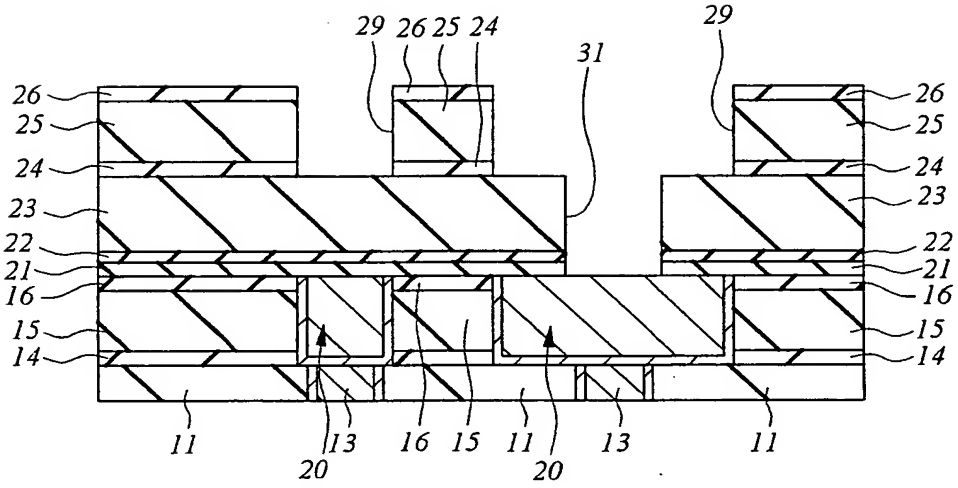
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FIG. 52

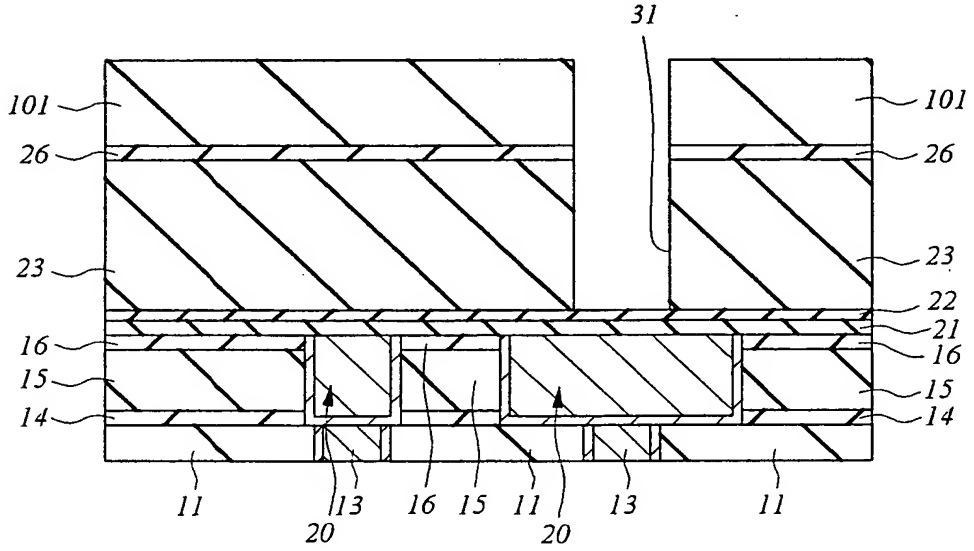
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FIG. 53

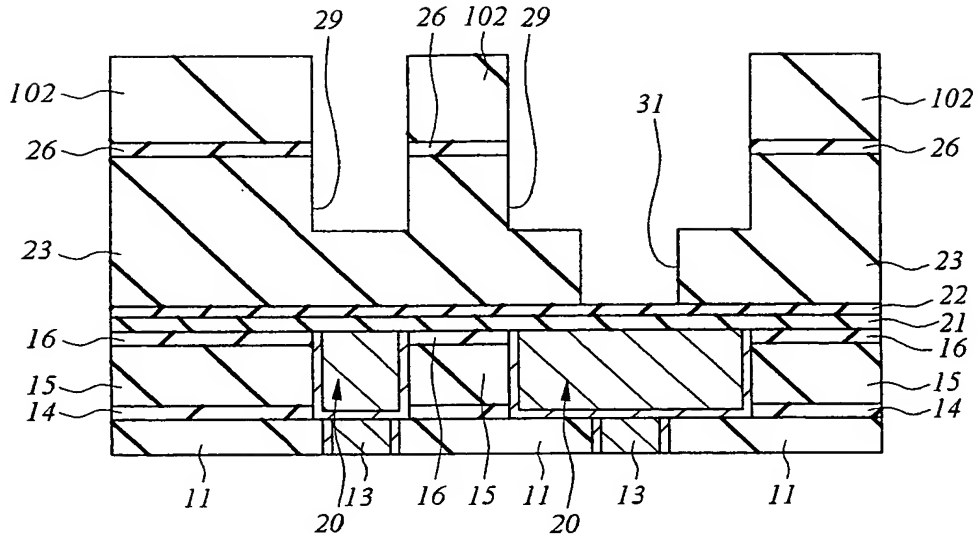
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FIG. 54

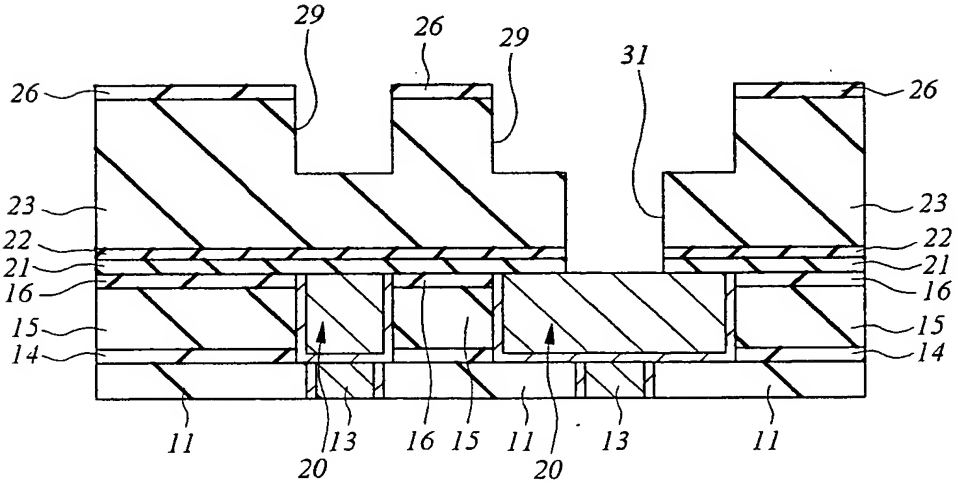
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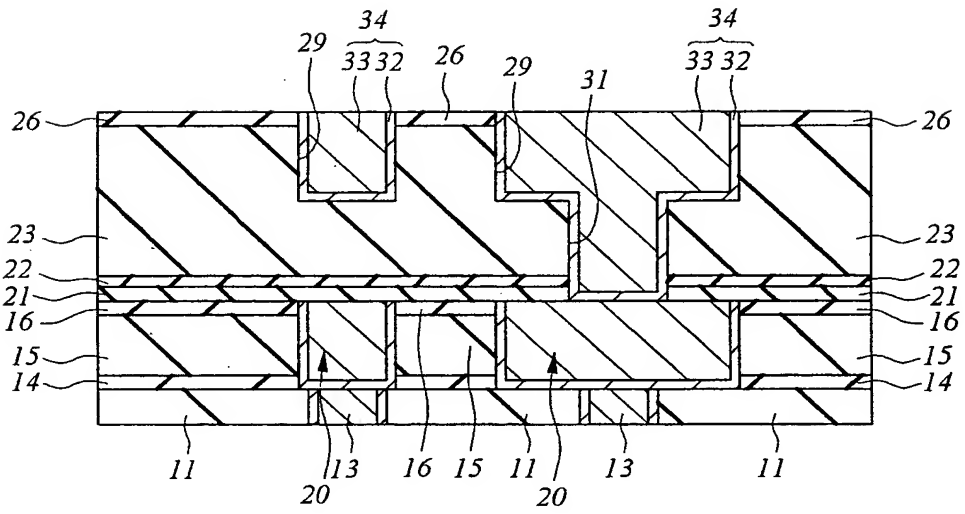
FIG. 55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